

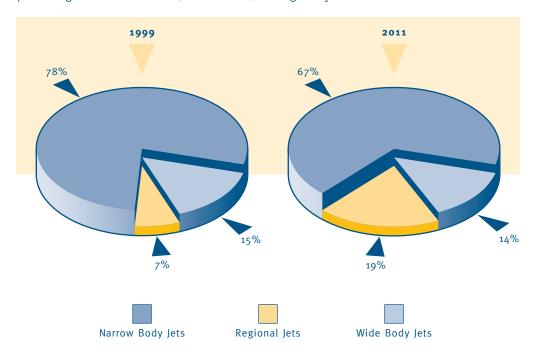
I REGIONAL JETS RESHAPE A DYNAMIC INDUSTRY

Regional jets (RJs) are one of the most dynamic factors currently affecting the aviation industry. Their rapid growth poses both challenges and opportunities for airports, the air traffic control system, and airlines.

I.I Market Overview

The definition of a regional jet varies among industry sources. For the purposes of this chapter, an RJ is a turbofan-powered airplane seating 100 or fewer passengers. According to FAA statistics, in 1999 there were 343 regional jets in the U.S. fleet of 4,655 commercial passenger aircraft, seven percent of the total. The FAA forecasts that by 2001 the percentage of regional jets in the fleet will nearly triple, to 19 percent. Figure 1-1 compares the percentages of narrow bodies, wide bodies, and regional jets in the fleet for 1999 and 2011.





Regional jets are produced by a dedicated group of manufacturers that includes Bombardier, Embraer, British Aerospace, and Fairchild Dornier. In the past, jets with 35 to 50 seats have dominated the market, especially the Bombardier CRJ and the Embraer ERJ 145. However, the outlook for the most popular models is changing as RJs with greater seating capacity are developed. Bombardier is now developing the CRJ-70, with 70 seats, and Embraer is developing the ERJ 170, with 70 seats, and the ERJ 190, with 98 seats. Sales of these and other regional jets are projected to exceed \$57 billion in the next decade.

Because of their growing importance, the FAA has increased its focus on the impact of regional jets on the NAS. This chapter provides an overview of some of the most important issues:

- The operational characteristics of regional jets
- The role of regional jets in the aviation industry
- How market conditions, competition, and legislation are changing the role of regional jets
- How regional jets may impact airspace and airport capacity

I.2 Operational Characteristics of Regional Jets

Regional jets are positioned between narrow body jets, such as the B-737 and the MD-80, and larger turboprops, such as the Saab 340 and the Bombardier Dash-8. The seating capacity of most regional jets in operation is comparable to that of the larger turboprops, while their performance is comparable to that of the narrow body jets. Figure 1-2 compares the seating capacity of turboprops, regional jets, and narrow body jets and Figure 1-3 compares their cruising speeds.

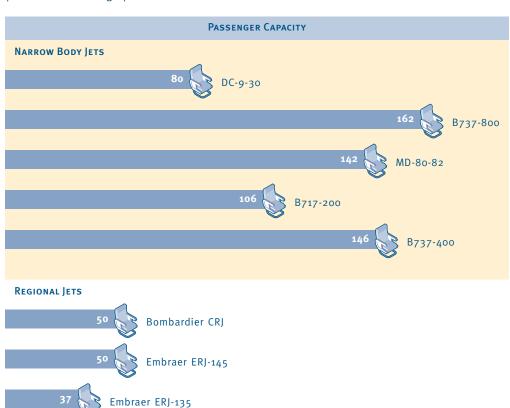
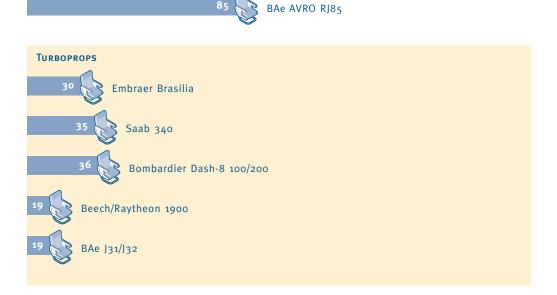
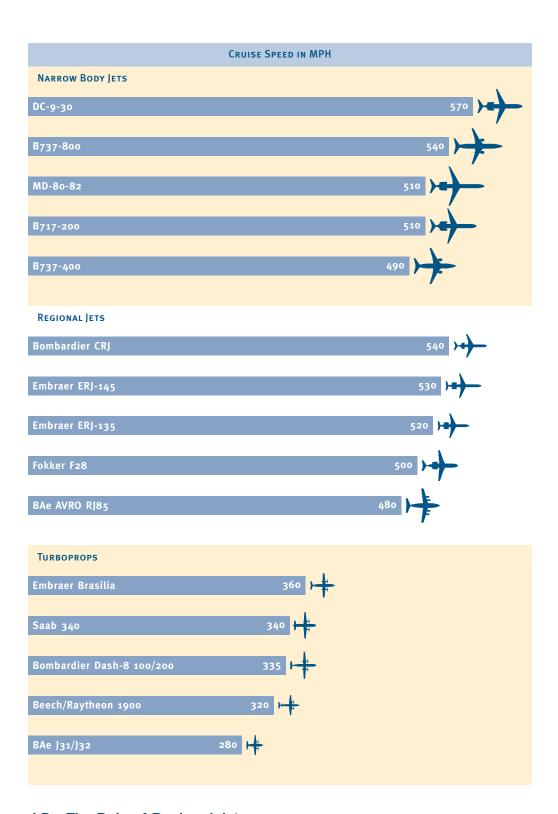


Figure 1-2 Seating Capacity of Turboprops, Regional Jets, and Narrow Body Jets



Fokker F28

Figure 1-3 Cruising Speed of Turboprops, Regional Jets, and Narrow Body Jets



I.3 The Role of Regional Jets

The widespread use of regional jets is a relatively recent phenomenon. Air carriers are using regional jets to achieve a number of strategic objectives:

- ➤ To replace turboprop aircraft in certain markets
- > To provide additional seating capacity in turboprop markets during peak traffic times
- To provide new service in existing hub-and-spoke systems (hub extension)

- To provide point-to-point service between smaller markets (hub bypass)
- To replace larger jets on routes that are marginally profitable for them, but can be profitable for regional jets
- To stimulate traffic by shifting car, rail, and bus travelers to air

 Although the strategic positioning of RJs by regional and major air carriers has been important, their rapid growth can be largely attributed to their popularity among travelers. Passengers prefer regional jets because they are more comfortable, quieter in the cabin, and faster than turboprops. The replacement of turboprops is one of the factors contributing to RJ growth, but there will always be a role for turboprops. Many small communities with stable or declining populations, seasonal traffic, or airport facilities that were built for turboprops will sustain their operation. In general, the economics of routes of less than 250 miles favor turboprops, while routes of 250 to 700 miles favor regional jets.

1.4 The Changing Role of Regional Jets

During the past decade, major and regional carriers have formed strategic marketing alliances and code sharing agreements to align hub schedules and improve profits. In addition, some majors have purchased regional carriers outright and are operating them as fully-owned subsidiaries. As this trend continues, the distinction between regional carriers and major airlines is becoming increasingly blurred.

Recent legislation is also expected to foster the growth of regional jets. AIR-21 includes provisions to improve service to small communities. AIR-21 will increase access to LaGuardia, Kennedy, and O'Hare airports by phasing out slot controls. This initiative, which encourages new service to smaller communities from these airports, should affect the rate at which new regional aircraft enter the system. In particular, for airlines to qualify for new landing rights at LaGuardia, they must use regional jets. In response, a number of carriers have already initiated or announced plans to expand their regional jet service to LaGuardia. AIR-21 also creates an incentive program to help airlines buy RJs if they agree to use them to serve small airports and establishes an Air Service Development program for small-hub and non-hub airports.

AIR-21 also includes provisions to maintain the integrity of the Essential Air Service (EAS) program. Initially established by the Deregulation Act of 1978, EAS maintains subsidized air service to smaller communities. Since 1978, the number of communities that receive EAS funding has increased from 322 to 499. The continuation of EAS subsidies will maintain service to small communities that are primarily served by piston aircraft, turboprops, and smaller regional jets.

Although most forces are stimulating RJ growth, their continued expansion and the rate of their integration into the NAS may be slower than predicted. Factors that could hinder RJ growth include saturated airport and ATC capacity, increased regulatory costs, environmental issues, and labor concerns such as scope clauses.¹

1.5 The Impact of Regional Jets on Airspace Capacity

The increased use of regional jets is changing the distribution of traffic in both en route and terminal airspace. Regional jets can fly at higher (and more fuel-efficient) altitudes than turboprops. As RJs replace turboprops, the number of aircraft using high altitude airspace on certain routes may increase, straining airspace capacity at higher altitudes and reducing

Most contracts between major airlines and their pilot groups contain scope clauses that limit the number and type of regional jets that a carrier or its affiliates can operate.

traffic at lower altitudes. At the same time, when RJs are used in place of larger jets to bypass hubs, high altitude airspace on some currently congested routes may be freed up.

In terminal airspace, replacing turboprops with RJs may lead to an increase in traffic complexity, which would reduce controllers' options, especially during peak traffic periods. For example, controllers frequently assign departing turboprops divergent headings from those of jet aircraft, since they will use a different altitude or route to exit terminal airspace. This procedure increases departure runway capacity, since large in-trail separations are not required. However, as regional jets replace turboprops, the opportunity to use divergent headings may be reduced. Another air traffic procedure that controllers have used with turboprops, land and hold short (LAHSO), is not an option for regional jets at certain airports because they require a longer distance to stop, so they can land but cannot hold short of intersecting runways.

I.6 The Impact of Regional Jets on Airport Capacity

Regional jets require longer runways than turboprops, generally at least 6,000 feet, although runway requirements vary among RJ models. According to FAA records, there are 35 runways that are less than 6,000 feet long at large and medium hub airports, including Washington Reagan National, Philadelphia International, Chicago Midway, and Raleigh-Durham International.

Runway length requirements also depend upon the elevation, temperature, payload, and flight distance. In particular, RJ flights of less than 500 miles may be able to land safely on runways that are shorter than the published requirements for fully loaded aircraft. Since the average RJ flight in 1998 was only 375 nautical miles, many RJ flights will be able to use runways that are shorter than 6,000 feet. As Figure 1-4 indicates, the runway length requirements for the most popular regional jets for flights of 500 nautical miles are well below this threshold.

Figure 1-4Runway Length Requirements for Regional Jets

Aircraft	RLR for Maximum Range Flight			RLR for 500 NM Flight
	Range (NM)	ISA*	ISA + 15°C**	ISA +15°C**
CRJ 100	1,760	6,100 ft	6,800 ft	5,200 ft
CRJ 200	1,920	6,300 ft	7,000 ft	5,000 ft
ERJ 135	1,420	5,250 ft	5,540 ft	4,430 ft
ERJ 145	1,620	6,460 ft	6,730 ft	5,810 ft

^{*} International Standard Altitude (ISA) at sea level.

In general, for those airports that were built or modified for jet operations, RJs will require only limited, if any, modifications. However, the ability of those airports to accommodate an increased number of regional jets depends on its current capacity level. A small, under-utilized airport designed for commercial jet operations may be able to easily accommodate additional RJ flights. A large airport may be limited in its ability to add RJ operations if it is already congested and relies on shorter runways for turboprop operations.

^{**} ISA plus 15°C is equivalent to 86°F.

The introduction of RJs to airports that were not designed to handle jets may require significant modifications. A recent FAA study evaluated the impact of regional jets on airport design issues,² and concluded that:

- Runways that meet the standards for crosswinds for turboprops will also meet the standards for RJs
- Airports whose taxiway systems support turboprop operations should also meet the requirements of RJs
- ➤ RJs will not affect runway-to-runway separations
- > RJs will not affect Obstacle Free Zone dimensions
- Airports that were designed to accommodate only turboprops may need to make modifications to account for the effects of jet blast
- FAA standards for the dimensions of Runway Safety Areas, the safety zone surrounding the runway, will increase where RJs replace turboprops
- FAA standards for the dimensions of Runway Protection Zones, the buffer between an airport and the surrounding communities, will increase when RJs replace turboprops

I.7 Summary

Most aviation analysts expect the size of the regional jet fleet, the number of RJ operations, and the number of airports they serve to continue to grow rapidly for the foreseeable future. Although the cyclical nature of the airline industry makes it impossible to predict trends with certainty, it is clear that regional jets will continue to drive changes in airport and airspace use. The FAA will continue to work with the industry to develop new infrastructure and air traffic management procedures to ensure the continued safe and efficient operation of regional jets in the NAS.

² Kenneth C. Jacobs, The Impact of Regional Jets on Airport Design, Airport Design Division (AAS-100), Federal Aviation Administration.